

EMOTION AI

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LIST OF ABBREVIATIONS

EAI - Emotion Artificial Intelligence

TTS - Text-to-speech

NLP - Natural Language Processing

ABSTRACT

For many years, people have wondered if AI would ever have the ability to make moral choices. Or if a machine could predict whether a person is mentally ill. What if AI could express emotions rather than just detecting them?

Considering the inclusion of Emotions with artificial intelligence, two interesting domains play a prominent role:

1. AI recognizing the Human Emotions
2. AI itself expresses/mimics Human Emotions.

INTRODUCTION

"Can robots think?", Alan Turing addressed the question. A question like this gave birth to the game of imitation, which was known as the Turing Test. The proposal obfuscates the core debate over whether the human mind model is unique and exclusive, i.e., whether there are other methods of thinking except the human. The current work follows Turing's lead and assumes the answer is yes. As a result, AI does not have to replace or overlap human intelligence, but it can be a beneficial tool when used in combination with it. AI and humans can always learn from each other.

Artificial Intelligence that recognizes and decodes human emotional signals is termed Emotion AI. The niche for detection can be of many types like Text, Audio, Video and can be a mix of the above.

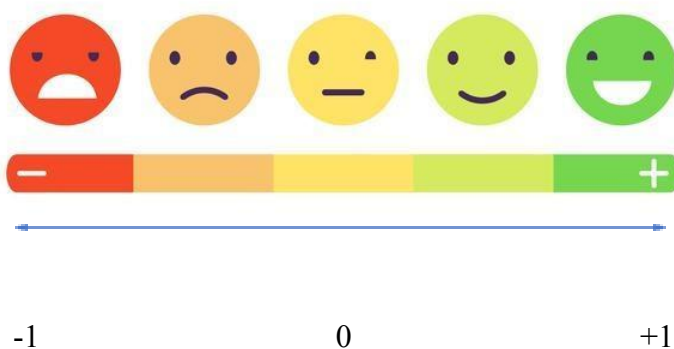
Text Emotion AI

Text EAI uses sentiment analysis for processing the natural language of test samples to determine whether the sentiments expressed are positive or negative, and to what degree.

Transfer learning for pre-trained models is a popular strategy nowadays. Even if there is a large pre-trained model, you must perform the "last-mile" training using your data. You obtain the accuracy you want by tailoring it for your particular needs by conducting that last-mile training.

Text Emotion AI has progressed to the point where it is now a widely used tool in a variety of industries, from marketing to banking, where it will be used to analyse posted reactions for their products or services. It is also a most popular technique to forecast stock movements and in aiding the users with recommendations.

The below figure used to analyse the polarity of the text from negative to positive using emotion scale:



The term polarity refers to the sentence's positivity. A score of +1 indicates that something is highly positive, a score of -1 indicates that something is highly negative, and a score of 0

indicates neutrality of the text. It might be simple, such as happy, sad, or angry, or it can be hierarchical, with many categories rather than just positive and negative. To represent the intensity of sentiment, the initial refinement was positive or negative and then it will be scaled from -1 to +1, where, for example: "I'm furious" is more intense than "I'm angry."

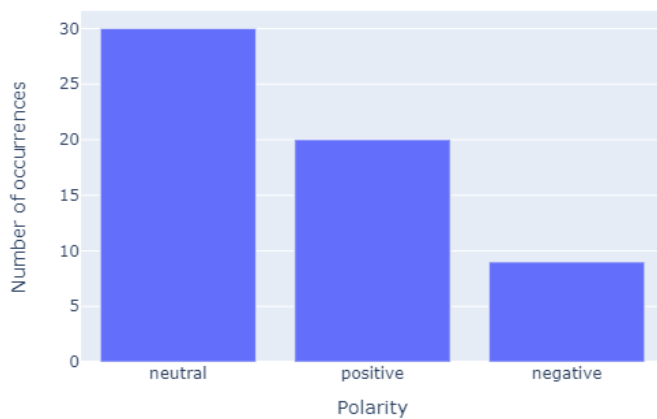
Furthermore, A subjective sentence reflects personal sentiments, opinions, or convictions. A subjective statement may or may not convey any emotion. "I believe he returned home" and "I want a camera that can take good shots" are two examples of subjective sentences that do not convey any emotion.

Generated sentiment analysis report using NLP for each sentence from a sample text:

Text	Polarity	Subjectivity
Who will help me here? “The problem becomes worse if you’re in a place where there aren’t a lot of people, or they don’t speak your language.	-0.400000	0.600000
User involvement is what sets us apart from all other similar services out there.	-0.062500	0.387500
It’s simple – we focus on the user instead of the market.	0.000000	0.357143
Download maps for offline use.	0.000000	0.000000
The best solution to this is making a web app.	1.000000	0.300000

A graph representing polarity along with the number of occurrences for each class:

Polarity occurrences in bar graph



Voice Emotion AI

Emotion recognition in speech technology is just the start of a journey to make our voice interactions more human-like, personalised and branded. The awakening of emotional intelligence in speech AI systems to develop emotionally-appropriate answers based on the many emotions identified in the user's voice is the next natural step in this process.

Some businesses, such as OTO, have developed voice analytics models that can detect unique speaker characteristics, such as voice gender and language, as well as determine the human speaker's emotion and energy levels. Call centres are using these insights to develop a new way to gauge sentiment and customer happiness.

Voice EAI focuses on what we call honest signals, which are everything in the conversation other than the words - energy in the voice, pauses, intonation, and a wide range of other

signals that help us understand people's intents, ambitions, and emotions by constructing a very rich signal of information.

The technique of melding the two data streams is going to be the technological leap forward. One data stream includes the vocal information and the other stream contains the content of the conversation/speech. The ability to truly combine the understanding of NLP with the honest signals will give us the best way to understand the emotion in conversation along with improvising the accuracy of detection for unseen voice patterns.

Recalibration of the baseline is difficult to fix when getting into voice patterns. Consider how we express excitement versus rage. Although they both can be high-pitched, there are some slight variances. And our brains are good at distinguishing between the two. Even if you're watching a foreign-language film without subtitles, you can discern whether a character is angry or excited simply by listening to their voice. What's the best way to codify that?

It was discovered that when a new language data set is recalibrated, the variance from the baseline that detects those specific signals is nearly the same across all cultures. To readjust that baseline, we only need 10 to 20 hours of data, with a maximum of 50 hours.

Some characteristics are extremely complicated. No technology can pinpoint sarcasm completely. But, for the most part, you're focusing on several crucial interaction characteristics. The primary human emotions—happiness, sadness, fear, anger, surprise, and disgust—could be used to train the TTS to replicate human emotions. Even yet, our voice assistants won't be truly emotional intelligent until they can adapt and replicate all 27 types of emotions that influence everything we do, including decision-making.

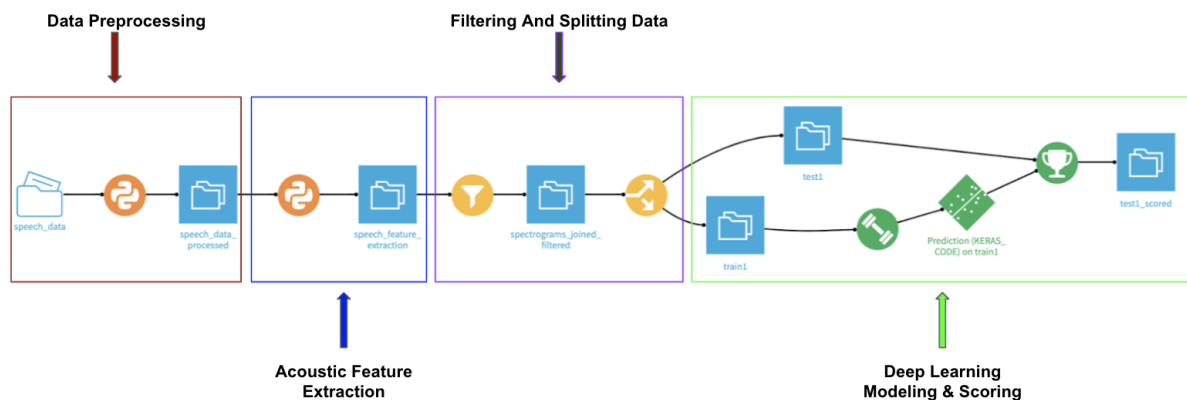
Analysing a real-world scenario:

Consider a driver is upset by traffic and is travelling in a new location, so he or she asks for instructions to avoid further delays. The voice assistant assessed that person's voice as frustrated and perplexed by its tone and tenor. Further driving directions can be delivered in a slow, calm, and regulated voice in response.

When the in-car voice assistant recognises a potentially risky driving condition based on the driver's mental state, proactive suggestions can be made. Lowering the car's temperature, activating the driver's side chair massage, lowering the dashboard lighting, or playing calming music can all help to relieve stress in the driver.

Driving can be a tedious and lonely experience in some instances. Currently, a voice assistant that can operate as a co-pilot by providing navigation, destination information, and in-car controls via hands-free control makes driving more convenient and safer. If the same voice assistant possesses emotional intelligence, it can serve as a front-seat passenger, providing companionship and reducing boredom. Long-distance truckers now have a human-like companion to talk to while driving, joking about and sharing information. Carrying on a conversation with another entity adds an element of involvement to in-car entertainment that could reduce weariness and daydreaming while also increasing the safety of solo driving.

The data flow for Emotion recognition from audio is as follows:



Video Emotion AI

Emotion from Video signals is also a most popular technique. This covers not only face expression analysis but also gait analysis and video analysis of specific physiological data. Under the correct circumstances, a person's respiration and heart rate can be detected contactless using cameras.

Emotion, on the other hand, is a hazy concept. And putting some of these technologies to use in high-stakes scenarios can be quite difficult. However, the most well-known application of "Video Emotion AI" is a hiring system that determines an "employability score" based on job seekers' facial expressions and voice patterns.

This multimodality highlights an important point: our faces rarely if ever, give the entire story. It's still up for debate whether facial expressions accurately communicate emotion or not.

EMOTION AI AS A KEY TO MENTAL HEALTH TREATMENT

In the field of mental health, there have been some promising developments in recent years. People are becoming more outspoken about it, shattering the stigma and seeking therapy. Despite this upward trend, the number of people in need of mental health treatment remains significant.

Emotion artificial intelligence (Emotion AI) is a promising technology that provides clinical staff with another way to support and monitor their patients' well-being. This technology can detect small indications in people's voices, writing, and facial expressions and respond appropriately, exactly like a human. This adaptability is not only astonishing but also quite useful. Above all, technology can help bridge the gap between interactions with human specialists by connecting and filling knowledge gaps.

Emotion AI has a plethora of applications, especially in the disciplines of psychology and healthcare. By analysing patient records and providing reports based on the data, handling administrative activities, and even assisting with diagnosis or intervention, Emotion AI can free up doctors to spend more time with their patients. Emotion AI can also assist patients in being more aware of their emotional states and better regulating their emotions in stressful or challenging situations.

AI can assist doctors and therapists in increasing emotional awareness in their patients, such as showing empathy, as well as providing diagnoses more swiftly and accurately. It can also be a useful tool for predicting how patients will approach therapy and taking steps to guarantee that they are effective and stick with it.

Emotion AI can assist healthcare providers in providing better care and lowering mental health treatment expenses by accompanying them.

Emotion AI for Personalized Virtual Therapy using Chatbots

Interacting with a chatbot or a robotic companion powered by emotion AI may not be the first thought that springs to mind when you think of treatment, but for many patients, it can be extremely beneficial. Several firms are working on avatars and assistive robots to provide patients with therapeutic choices.

When it comes to offering treatment for mental diseases, chatbot technology can fulfil a variety of roles. Although it may appear that a computer cannot perform the very intimate duty of providing therapy, many people interact with avatars in the same way that they would with another human.

Furthermore, unlike a human therapist, virtual therapists may encourage more in-depth sharing. Some patients may feel more comfortable discussing their problems with a machine than with another individual. An emotion AI-powered chatbot can be liberating for patients who struggle to feel at ease in a therapeutic situation. Chatbots provide an emotionally safe atmosphere for sharing, much like an imaginary play with virtual companions establish a safe setting for children's emotional and social growth. However, many of the earliest results haven't been completely validated in well-controlled research across situations and populations, despite their promise in terms of capabilities and complementing human expert help.

Most importantly, emotion AI technology automates conversation therapy and accessibility, allowing for greater access to one of the most expensive and time-consuming forms of mental health treatment. Those who can't afford typical therapy sessions or can't find the time to arrange them now have a different option for discovering and receiving treatment. Rather than scheduling an appointment in advance, these solutions can be made available when people need them. This feature has the potential to make chatbots extremely effective as therapeutic assistance that works in tandem with traditional therapy methods. Although chatbot-assisted behavioural and therapeutic intervention is still a way off, chatbots that can help us be more conscious of our feelings and more sociable are here to stay.

The below figures are of chatbot developed for predicting mental health illness of a person using a trained AI model in the backend:

Are you stressed about your daily work?

Never Sometimes Often Rarely NA

Any family history for mental illness?

Yes No

Do you think you will be benefited from a psychological therapy?

Yes No Don't know

Do you have any mental health care options in your mind?

Yes No Not sure

Are your coworkers (if any) making you feel stressed or irritated?

Yes No Some of them

Do you often feel confused?

Yes No Don't know

Are you seeking any help for your mental illness?

Yes No Don't know

How do you get a leave if required?

Don't know Somewhat easy Very easy Somewhat difficult Very difficult

Write anything here which you want us to know about your mental health to predict your state of illness.

feeling anxious

Please select your gender

Male Female Others

Are you suffering from any physical illness?

Yes No Maybe

Please enter your age

19

Are you attending any wellness program for your mental illness?

Yes No Maybe

The result predicted by the model:

You do not need mental
treatment (90.55% sure)

Predicting Suicide Risks with Emotion AI

Although Emotion AI can be used to cure patients, it can also be used to forecast their behaviour, such as their risk of suicidal conduct.

Facebook is one firm that uses emotion AI to monitor user posts, seek content that could indicate suicidality, and notify local authorities. After a popular feature that allowed users to

flag postings that could indicate suicidal intent and sent human moderators to look at the post and provide resources, this approach was established.

Emotion AI is being developed by developers to aid clinicians in identifying suicide risk and clinical care. Although still in its early stages, this technology has the potential to aid in the study of the risk factors that lead to suicide conduct. Researchers at Vanderbilt University developed an AI model that predicted suicide risk with 84 to 92 per cent accuracy within one week of a suicide occurrence and 80 to 86 per cent accuracy within two years using patient health records.

It's very early in the process of applying emotion AI to forecast suicide risk and assist direct healthcare providers in suicide prevention, but it's fascinating to watch this promising technology-facilitated skill emerge.

EMOTION AI IN COBOTS

There is a huge requirement for assistants with emotional intelligence in modelling the **collaborative robots** also called **cobots**, which are intended for direct human interaction.

Let's suppose, cobots are used as work assistants in industries, and if one of the human workers gets injured, the presence of cobots in such circumstances will command its emotional intelligence so that it can immediately respond with first aid or related solutions.

This type of Artificial behaviour is similar to actual humans' conduct.

CONCLUSION

Emotion AI sees a bright future collaborating with healthcare practitioners to meet the requirements of patients. AI models will be able to help provide therapy and care for many

individuals who would otherwise be unable to receive it owing to time limits or financial constraints. This technology is on the verge of transforming the way we think about and treat mental illness.

Although developers face numerous challenges, the future of technology support for mental illness appears bright, thanks to ongoing developments in Emotion AI capabilities.

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<https://inscribe.herokuapp.com/notes/breadcrumbs/>

AIuto - A Machine Learning model which predicts the mental illness of the user.

<https://aiuto.netlify.app/therapy>